National Aeronautics and Space Administration

Materials Informatics Enables Rapid Materials Discovery

Machine Learning and Digital Thread Infrastructure: A force multiplier for the development of “Fit-for-Purpose” materials

Challenge

- Top performing organizations rate **New Materials** as one of **THE MOST IMPORTANT** factors in meeting their innovation goals (Historically new materials ≥ 20 years)
- Need for faster, cheaper development of "fit-for-purpose" materials tailored to specific applications

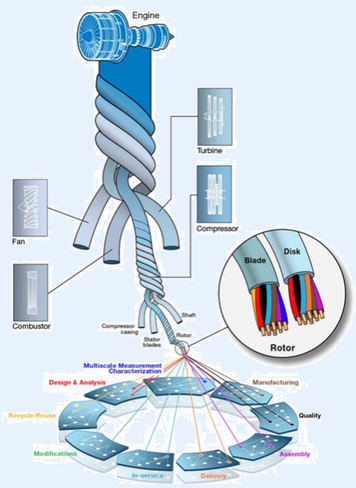
Expected Impacts

- Enable discovery of new materials for improved application performance
- Provide organizations with the framework for storing, managing, and disseminating large data sets for digital twin/thread maintenance

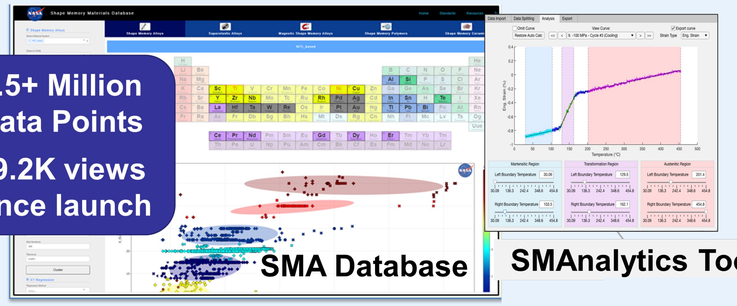
Solution

- Developing Machine Learning models for fast, consistent analysis of microstructures to enable discovery of process-property relationships
- Developed a robust schema for storing virtual and experimental data with full traceability
- Automated lab with AI generated experiments for high throughput experiments and discovery.
- JARAMIS framework to connect data management, data analysis, AI/ML, and automated experiments.

Microscopy Aware AI



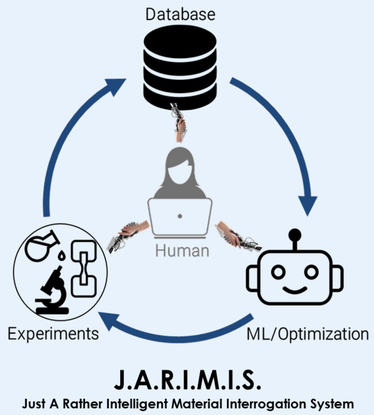
The Digital Thread for Required Lifecycle Information



1.5+ Million Data Points

59.2K views since launch

SMAnalytics Tool



J.A.R.I.M.I.S.

Just A Rather Intelligent Material Interrogation System

Results

Over 10,000 downloads of MicroNet models for microstructure analysis. Over 50,000 views to the publicly available shape memory alloy database and analytics tool. A robust schema and code to easily ingest and extract materials data from database.

Next Steps

- Integrate automated lab from ChemSpeed into JARAMIS framework to rapidly develop high power electrical insulation materials for electrified aircraft.
- Continue to develop MicroNet for additional image analysis tasks
- Automate digital twin creation at multiple length scales to optimize the material design process

Partners and/or Participants

- NASA GRC
- ASM International
- ANSYS Granta MI
- Materials Data Management, Inc.
- OCAS
- GE
- University of Massachusetts Lowell
- Boeing

IMAGINAVIATION